IoT BASED SAFETY GADGET FOR CHILD SAFETY MONITORING & NOTIFICATION

A PROJECT REPORT

Submitted by

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(Autonomous Institution)

Coimbatore.

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1.INTRODUCTION

1.1 Project Overview

- The general public has access to a website where they may view the seats that are available and purchase tickets.
- The individual who reserved the train will receive a QR code, which must be presented to the cash assessor while onboard the train.
- The tickets collectors can identify the personal information by scanning the QR code.
- The train has a GPS tracking gadget to keep track of it. The Web app regularly updates the trip's live status.
- When the ticket collector scans the QR Code, all of the customer's booking information will be saved in the database with a special ID and be retrievable.

1.2 Purpose

The Purpose of our Project is

- ✓ To decrease the parents' workload.
- ✓ Utilizing online notifications to keep an eye on the kids
- ✓ To locate youngsters in real time.
- ✓ To protect the children's safety
- ✓ To continue treating kids right when a parent isn't around.

2. LITERATURE SURVEY

2.1 Existing Problem :

- Real-Time Child Abuse and Reporting System

The alarm commands from the youngster are recorded and retained for future use in the voice recognition module of the current system. In the event that the same child issues the same command, it will compare it to the alert command that was previously recorded and adjust the emergency level in accordance with the alert command. The GSM features a SIM that is used to phone or send alarm messages to persons you can trust. When necessary, GPS is used to track the current location. The server will look up the appropriate device ID in the database, look for the appropriate contacts using that device ID, and assist in notifying the registered guardians.

2.2 References :

☆ McNally, B., Kumar, P., Hordatt, C., Mauriello, M. L., Naik, S., Norooz, L., ... & Druin, A. (2018, April). Co-designing mobile online safety applications with children. In Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems (pp. 1-9).

☆ Benisha, M., Prabu, R. T., Gowri, M., Vishali, K., Anisha, M., Chezhiyan, P., & Elliot, C. J. (2021, February). Design of Wearable Device for Child Safety. In 2021 Third International Conference on Intelligent Communication Technologies and Virtual Mobile Networks (ICICV) (pp. 1076-1080). IEEE.

☆ Jatti, A., Kannan, M., Alisha, R. M., Vijayalakshmi, P., & Sinha, S. (2016, May). Design and development of an IOT based wearable device for the safety and security of women and girl children. In 2016 IEEE International Conference on Recent

Trends in Electronics, Information & Communication Technology (RTEICT) (pp. 1108-1112). IEEE.

☆ Raflesia, S. P., & Lestarini, D. (2018, October). An integrated child safety using geo-fencing information on mobile devices. In 2018 International Conference on Electrical Engineering and Computer Science (ICECOS) (pp. 379-384).

☆R. R. Oliveira, I. M. G. Cardoso, J. L. V Barbosa, C. A. da Costa, and M. P. Prado, “An intelligent model for logistics management based on geofencing algorithms and RFID technology,” Expert Syst. Appl., vol. 42, no. 15, pp. 6082–6097, 2015.

2.3 Problem Statement definition :

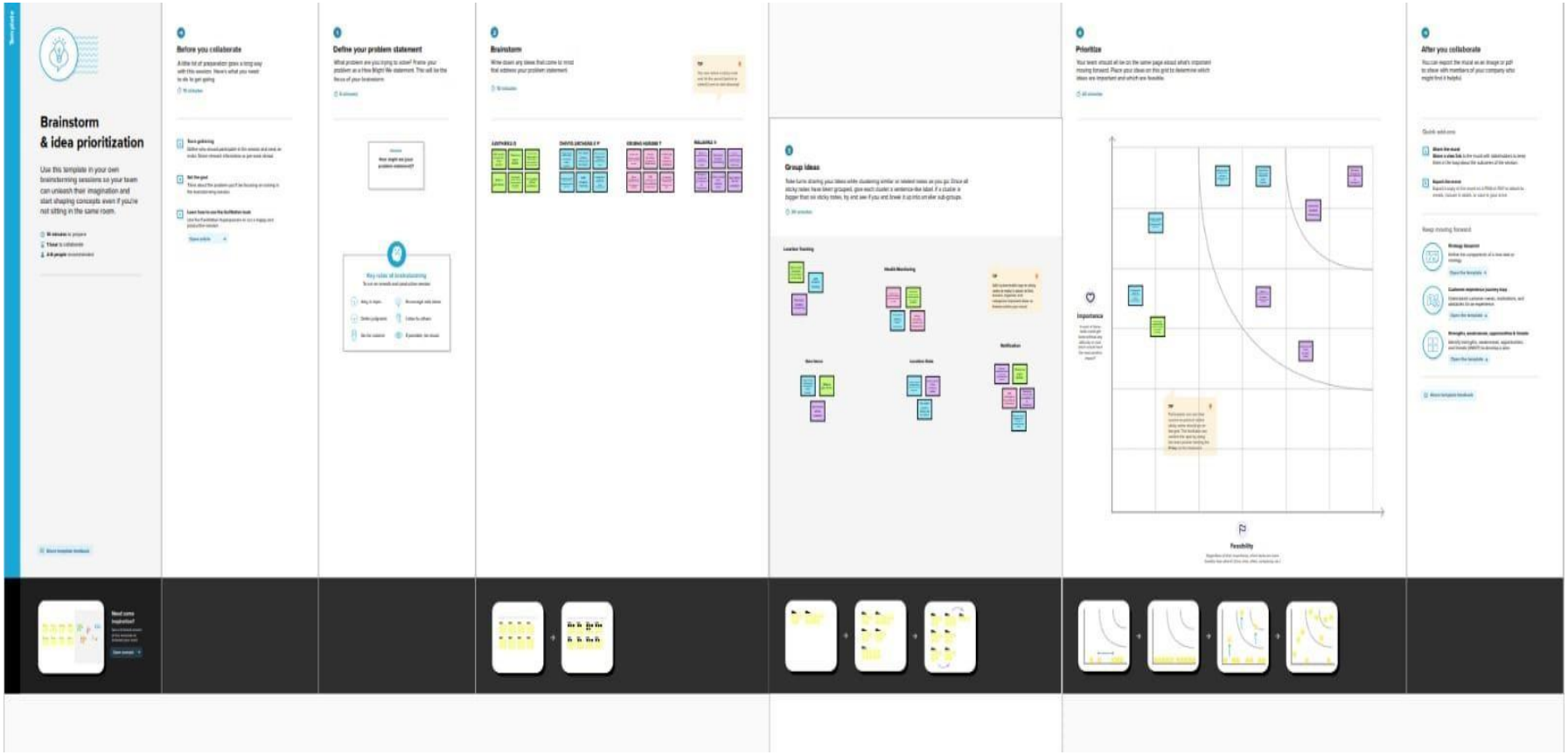
Enable location tracking for the kid and remote data collection for things like body temperature, pulse, breathing rate, sleep quality, and many more.

- To display the child's real data along with benchmark values.
- Enable notice sending when the child is missing or when the device detects unusual circumstances.
- To activate automatic video recording and set off the alarm anytime the emergency button is hit. Following that, real-time video and emergency notifications will be provided to and seen on the mobile apps for the parents.
- Create a working prototype of an Internet of Things (IoT) wearable smart band that can be connected to parental mobile apps to enable real-time monitoring of children's health wherever they are.

3. IDEATION & PROPOSED SOLUTION

3.1 EMPATHY MAP CANVAS

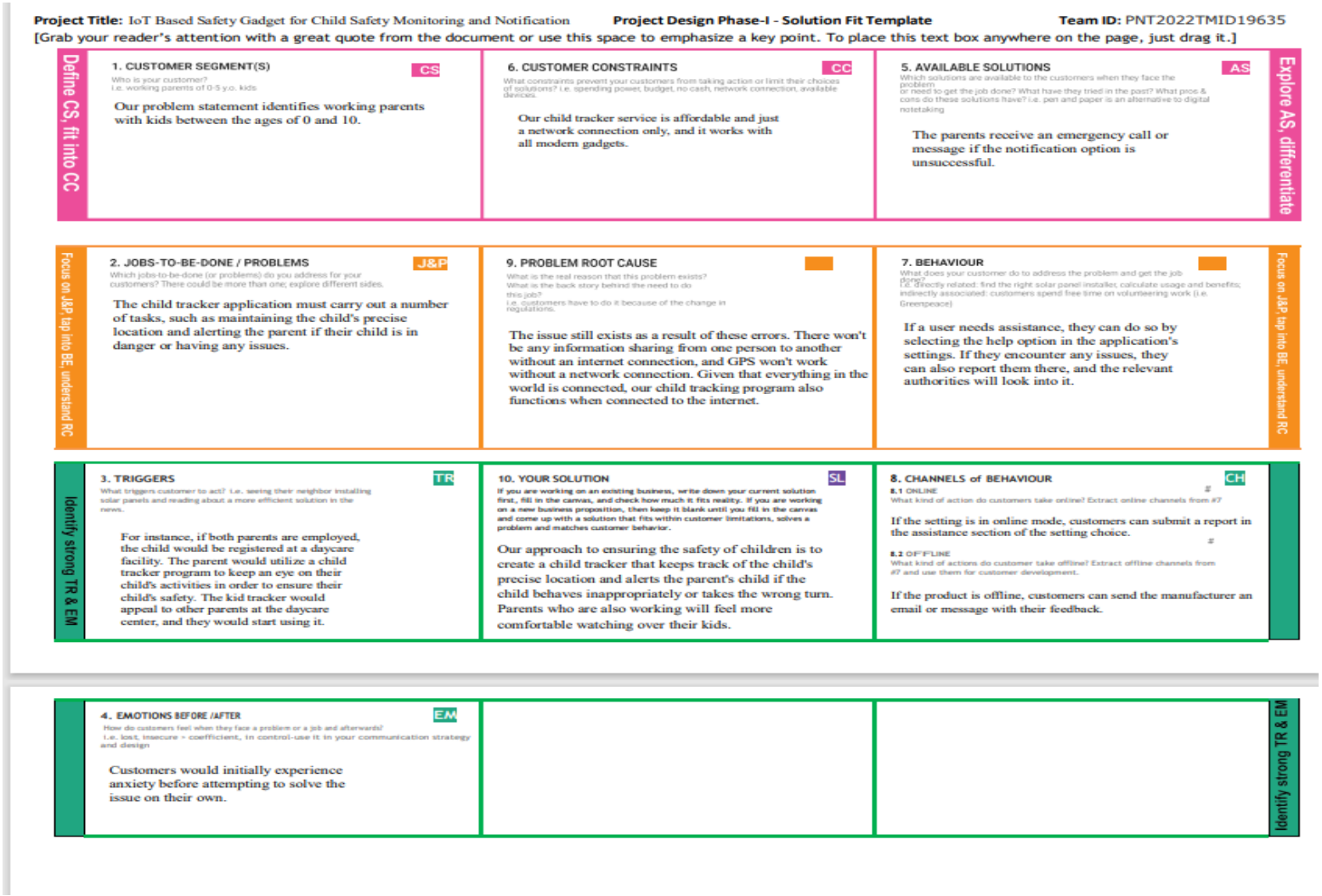
3.2 Ideation phase



3.3 Proposed Solution

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Kids are the lifeblood of all parent, as we all know, and parents need to take particular care with children who have special needs. If parents have jobs, they cannot watch over their children all the time.
2.	Idea / Solution description	• Our approach involves monitoring the child and creating a wearable device that can track their location. • Temperature, feelings, and moist detection utilizing the appropriate sensors. These are all parameters. • An alert message with a location and a phone call is initiated and sent to neighbors and the end user based on the sensor results.
3.	Novelty / Uniqueness	• Our system delivers a wearable GPS tracking device that can provide real-time notification and location data.
4.	Social Impact / Customer Satisfaction	• Improves more safety and freedom for kids to meet their needs.
5.	Business Model (Revenue Model)	Our system offers a futuristic framework so that new technologies on the market that are compatible with it may be quickly incorporated, increasing revenue and providing several advantages at a reasonable price for users.
6.	Scalability of the Solution	• It is a mobile device. • It is less expensive and more effective. • It doesn't need a lot of maintenance.

3.4 Problem Solution fit



Project Title: IoT Based Safety Gadget for Child Safety Monitoring and Notification **Project Design Phase-I - Solution Fit Template** **Team ID:** PNT2022TMID19635

[Grab your reader's attention with a great quote from the document or use this space to emphasize a key point. To place this text box anywhere on the page, just drag it.]

Define CS, fit into CC

1. CUSTOMER SEGMENT(S) CS

Who is your customer?
i.e. working parents of 0-5 y.o. kids

Our problem statement identifies working parents with kids between the ages of 0 and 10.

6. CUSTOMER CONSTRAINTS CC

What constraints prevent your customers from taking action or limit their choices of solutions? i.e. spending power, budget, no cash, network connection, available devices.

Our child tracker service is affordable and just a network connection only, and it works with all modern gadgets.

5. AVAILABLE SOLUTIONS AS

Which solutions are available to the customers when they face the problem
or need to get the job done? What have they tried in the past? What pros & cons do these solutions have? i.e. pen and paper is an alternative to digital notetaking

The parents receive an emergency call or message if the notification option is unsuccessful.

Explore AS, differentiate

Focus on J&P, tap into BE, understand RC

2. JOBS-TO-BE-DONE / PROBLEMS J&P

Which jobs-to-be-done (or problems) do you address for your customers? There could be more than one; explore different sides.

The child tracker application must carry out a number of tasks, such as maintaining the child's precise location and alerting the parent if their child is in danger or having any issues.

9. PROBLEM ROOT CAUSE

What is the real reason that this problem exists?
What is the back story behind the need to do this job?
i.e. customers have to do it because of the change in regulations.

The issue still exists as a result of these errors. There won't be any information sharing from one person to another without an internet connection, and GPS won't work without a network connection. Given that everything in the world is connected, our child tracking program also functions when connected to the internet.

7. BEHAVIOUR

What does your customer do to address the problem and get the job done?
i.e. directly related: find the right solar panel installer, calculate usage and benefits; indirectly associated: customers spend free time on volunteering work (i.e. Greenpeace)

If a user needs assistance, they can do so by selecting the help option in the application's settings. If they encounter any issues, they can also report them there, and the relevant authorities will look into it.

Focus on J&P, tap into BE, understand RC

Identify strong TR & EM

3. TRIGGERS TR

What triggers customer to act? i.e. seeing their neighbor installing solar panels and reading about a more efficient solution in the news.

For instance, if both parents are employed, the child would be registered at a daycare facility. The parent would utilize a child tracker program to keep an eye on their child's activities in order to ensure their child's safety. The kid tracker would appeal to other parents at the daycare center, and they would start using it.

10. YOUR SOLUTION SL

If you are working on an existing business, write down your current solution first, fill in the canvas, and check how much it fits reality. If you are working on a new business proposition, then keep it blank until you fill in the canvas and come up with a solution that fits within customer limitations, solves a problem and matches customer behavior.

Our approach to ensuring the safety of children is to create a child tracker that keeps track of the child's precise location and alerts the parent's child if the child behaves inappropriately or takes the wrong turn. Parents who are also working will feel more comfortable watching over their kids.

8. CHANNELS of BEHAVIOUR CH

8.1 ONLINE
What kind of action do customers take online? Extract online channels from #7

If the setting is in online mode, customers can submit a report in the assistance section of the setting choice.

8.2 OFFLINE
What kind of actions do customer take offline? Extract offline channels from #7 and use them for customer development.

If the product is offline, customers can send the manufacturer an email or message with their feedback.

4. EMOTIONS BEFORE / AFTER EM

How do customers feel when they face a problem or a job and afterwards?
i.e. lost, insecure > confficient, in control-use it in your communication strategy and design

Customers would initially experience anxiety before attempting to solve the issue on their own.

Identify strong TR & EM

4. REQUIREMENT ANALYSIS

4.1 Functional requirement

Functional Requirements:

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Requirements	To ensure the children's safety, a smart gadget will be supplied to the parents or guardians.
FR-2	User Registration	Manual sign-up using a website or Gmail
FR-3	User Confirmation	Confirmation by phone Confirmation through email OTP verification
FR-4	Payments options	No money is needed.
FR-5	Product Delivery and installation	According to the parent's and children's circumstances, the installation charge will be decided.
FR-6	Product Feedback	through a webpage using Gmail

Non-functional Requirements:

Following are the non-functional requirements of the proposed solution.

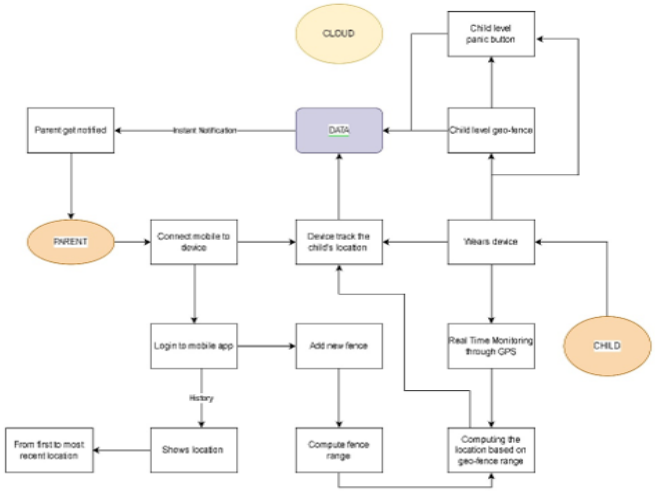
FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	Have self-explanatory products that are easy to use and have clear product instructions.
NFR-2	**Security**	It is necessary to get cloud data through the network, avoid collapsing and real-time avoidance and keep an eye on the device at all times.
NFR-3	**Reliability**	Hardware is regularly examined.
NFR-4	**Performance**	The smart device will give accurate output and a better user experience.
NFR-5	**Availability**	Depending on the requirements of the user, all required functions will be offered..
NFR-6	**Scalability**	The product must ensure that all child safety requirements are met because it is based on child safety.

5. PROJECT DESIGN

5.1 Data Flow Diagram

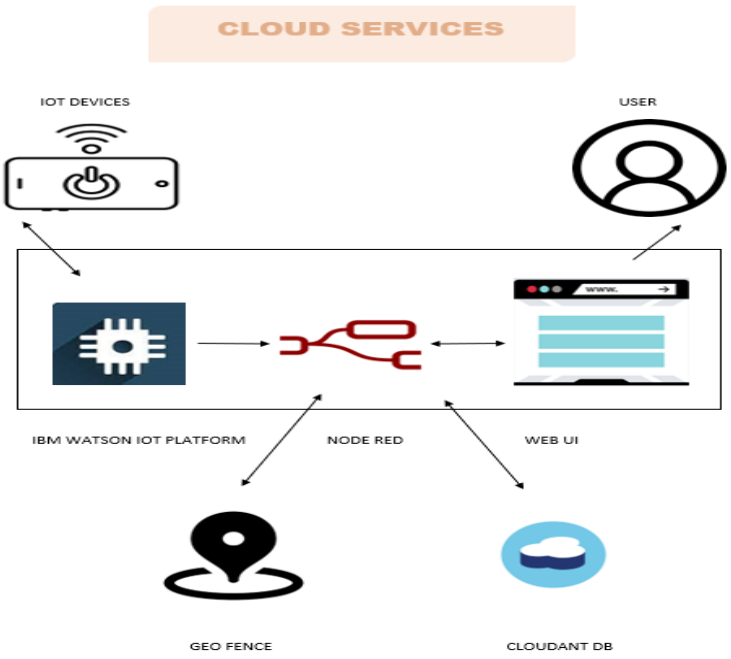
Data Flow Diagrams:

The classic visual representation of how information moves through a system is a data flow diagram (DFD). A tidy and understandable DFD can graphically represent the appropriate quantity of the system demand. It demonstrates how information enters and exits the system, what modifies the data, and where information is kept.

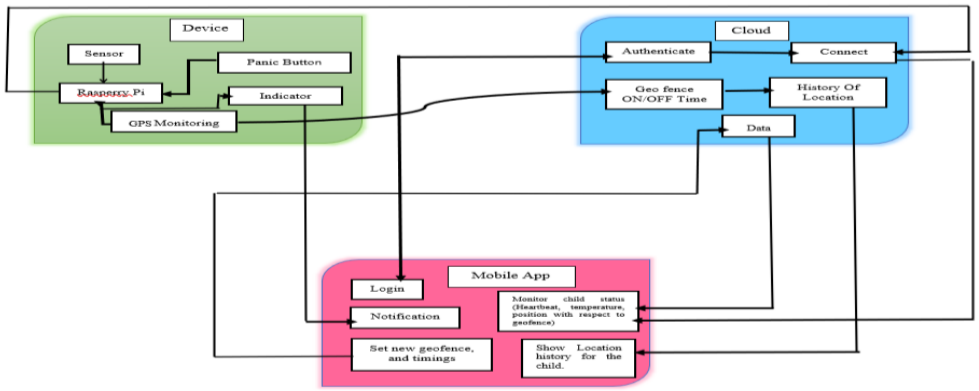


5.2 **Solution and technical Architecture**

Solution Architecture



Technical Architecture:



5.3 User Stories

User Stories

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Mobile user)	Registration	USN-1	I can sign up for the application as a user by providing my email address, a password, and a password confirmation.	I can get to my dashboard or account.	High	Sprint-1
		USN-2	When I register for the application as a user, I will get a confirmation email.	I can get confirmation emails and confirm them.	High	Sprint-1
		USN-3	I can sign up for the application as a user with my Google Account.	I can sign up and use my Google Account to view the dashboard.	High	Sprint-2
	Login	USN-4	I can access the application as a user by logging in with my email address and password.		High	Sprint-1
	Dashboard		I can always keep an eye on the child's whereabouts as a user.		High	Sprint-1
Customer Care Executive	Login		I can observe how the application is doing, look for any bugs, keep an eye on things, make sure everyone is permitted, and assist users as needed.	I can log in using the credentials I was given.	Medium	Sprint-3

6 PROJECT PLANNING & SCHEDULING

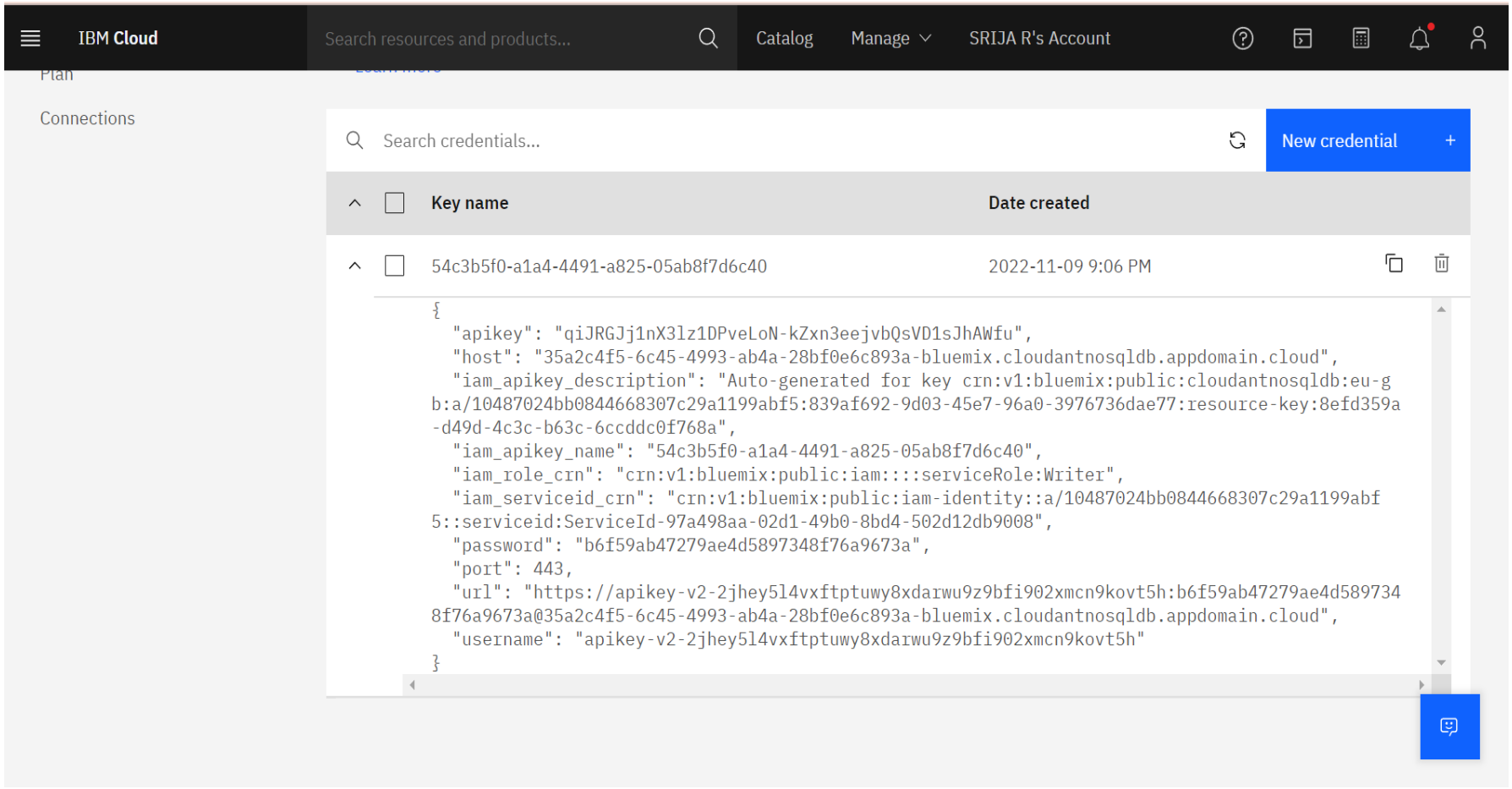
6.1 Sprint Planning , Estimation & Sprint Delivery Schedule

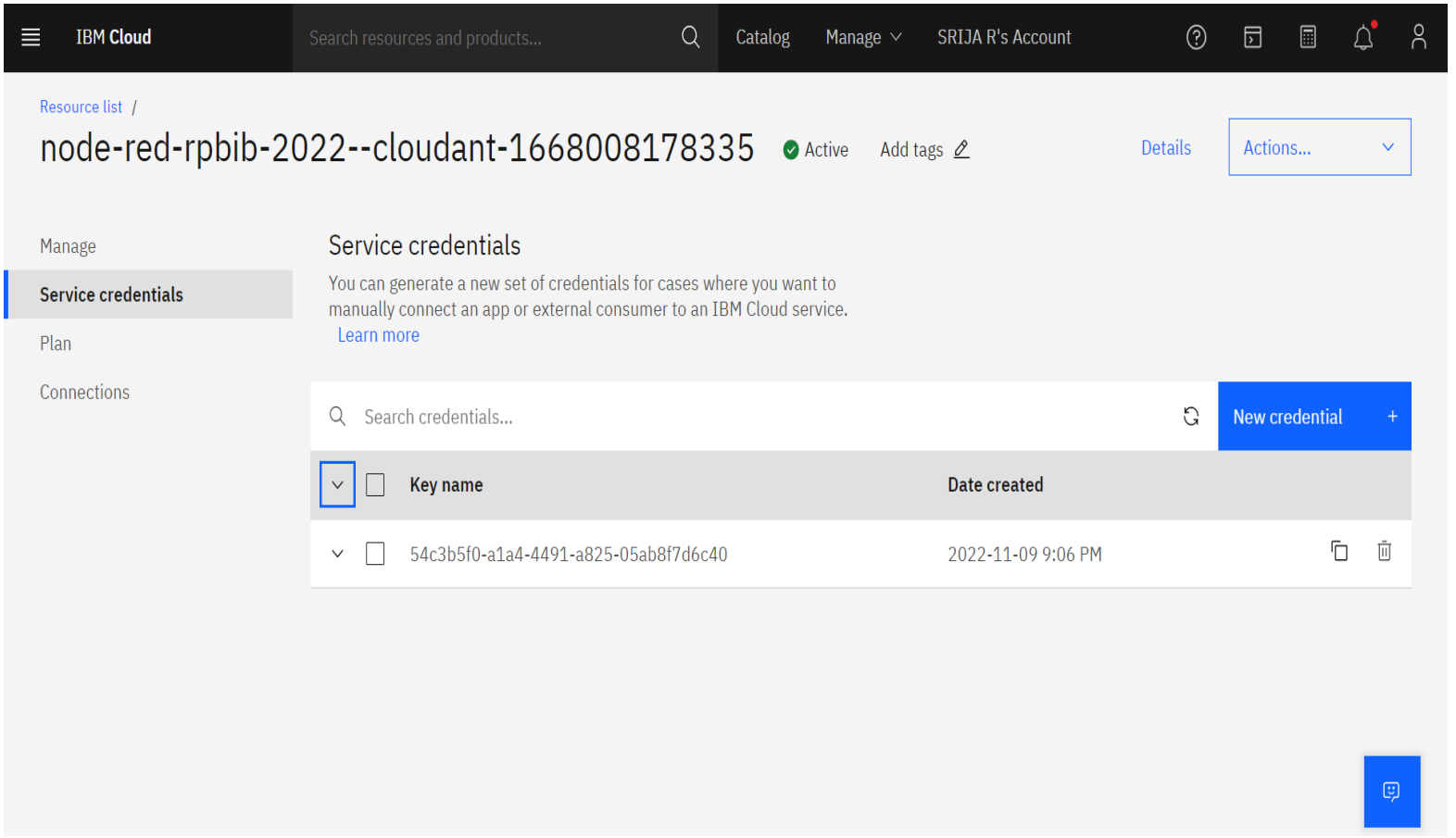
Use the below template to create a product backlog and sprint schedule

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Registration	USN-1	I can sign up for the application as a user by providing my email address, password, and password confirmation.	4	High	SRIJA
Sprint-1	Confirmation Email	USN-2	When I register for the application as a user, I will get a confirmation email.	4	High	PATHMAVASAN
Sprint-1	Authentication	USN-3	I can sign up for the application as a user using Gmail and a mobile app.	4	Medium	PRADEEP
Sprint-1	Login	USN-4	I can access the application as a user by providing my email address and password.	4	High	PRAVEEN
Sprint-1	Dashboard	USN-5	I must be able to see the actions that I can take as a user.	4	High	PATHMAVASAN
Sprint-2	Notification	USN-1	I should be allowed to alert my parents and legal guardians in an emergency as a user.	10	High	SRIJA
Sprint-2	Store data	USN-2	I must continually enter my location information into the database as a user.	10	Medium	PRAVEEN
Sprint-3	Communication	USN-3,1	I must be able to speak with my parents.	6	Low	PATHMAVASAN,PRADEEP

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-3	IoT Device – Watson communication	USN-1,4	The IBM Cloud should receive the data from IoT devices.	7	Medium	SRIJA, PRAVEEN
Sprint-3	Node RED- Cloudant DB communication	USN-5,2	The Cloudant DB should be appropriately connected with the IBM Cloud's data.	7	High	PATHMAVASAN, PRADEEP, PRAVEEN
Sprint-4	User – WebUI interface	USN-1,4	The user's input should be collected via the Web UI.	6	High	PATHMAVASAN, PRADEEP
Sprint-4	Geofencing	USN-2,3,5	Based on the child's GPS coordinates, geofencing should be implemented.	7	High	SRIJA, PATHMAVASAN, PRADEEP, PRAVEEN

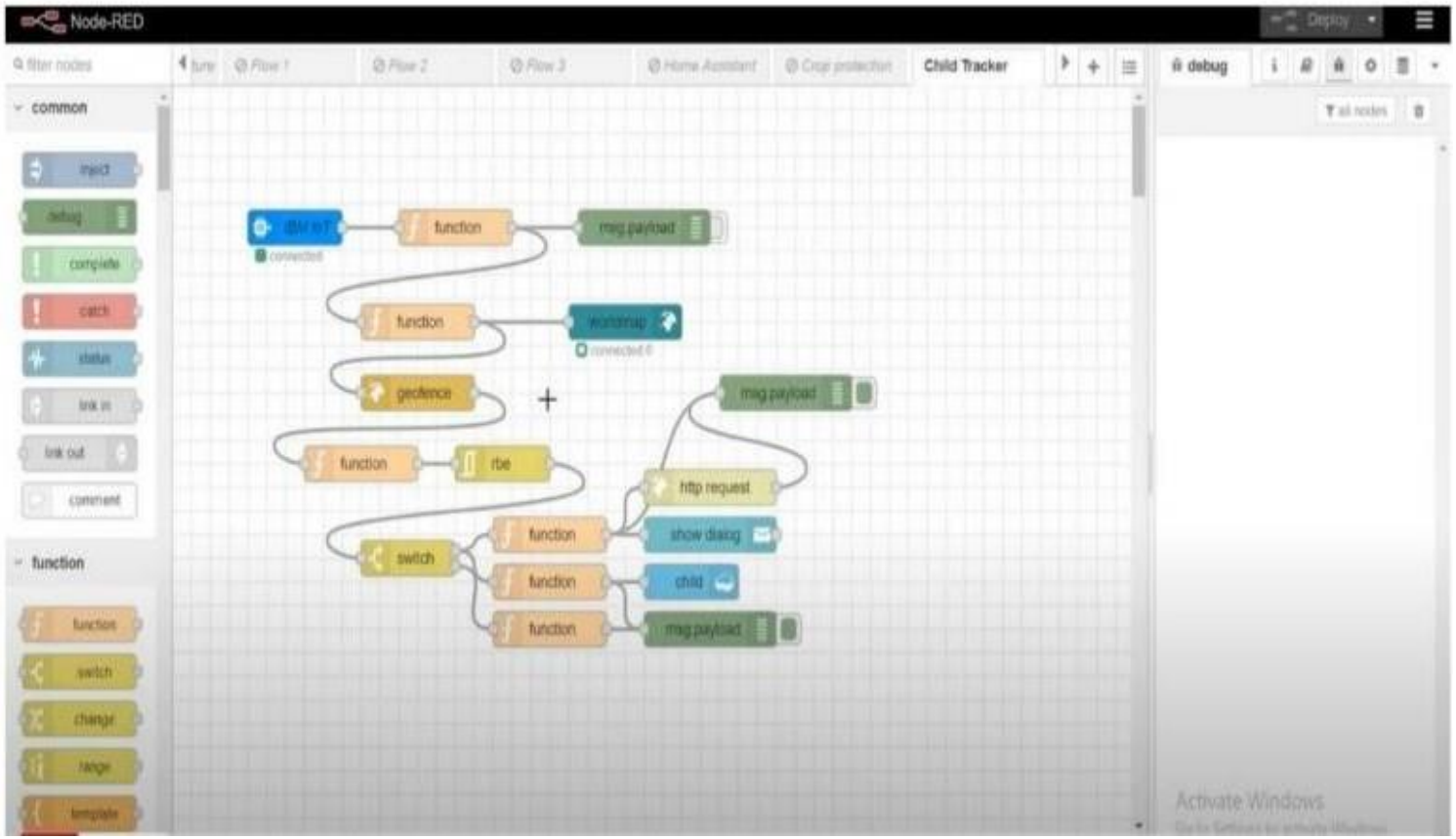
6.2 Database and Cloudant:




IBM Cloud
Search resources and products...
Catalog
Manage
SRIJA R's Account
Resource list /
node-red-rpbib-2022--cloudant-1668008178335
Active
Add tags
Details
Actions...
Manage
Service credentials
Plan
Connections
Service credentials
You can generate a new set of credentials for cases where you want to manually connect an app or external consumer to an IBM Cloud service.
Learn more
Search credentials...
New credential
Key name
Date created
54c3b5f0-a1a4-4491-a825-05ab8f7d6c40
2022-11-09 9:06 PM

6.3 DEVELOP WEB APPLICATION USING NODE RED:

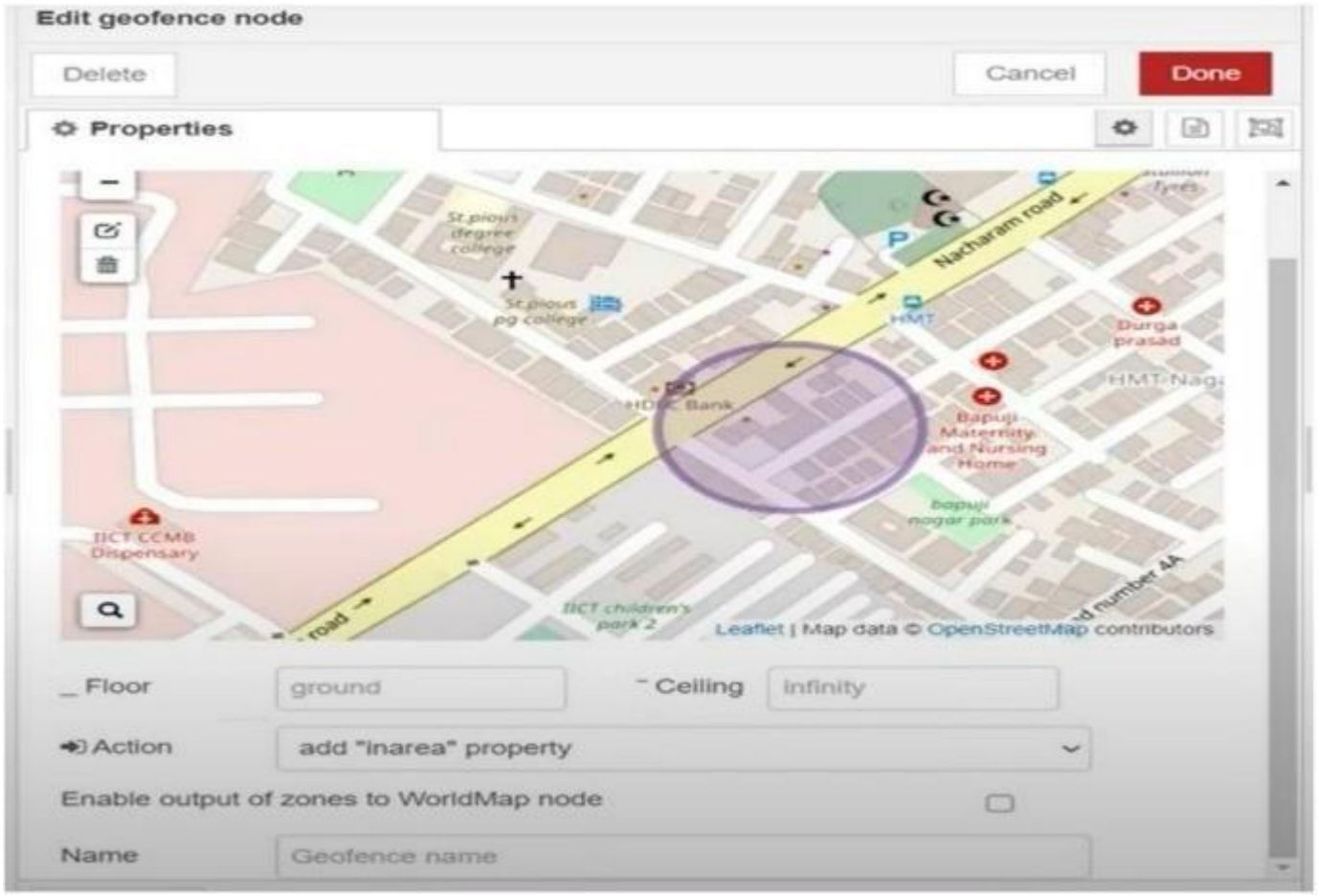
1. Open a Node-Red Project:



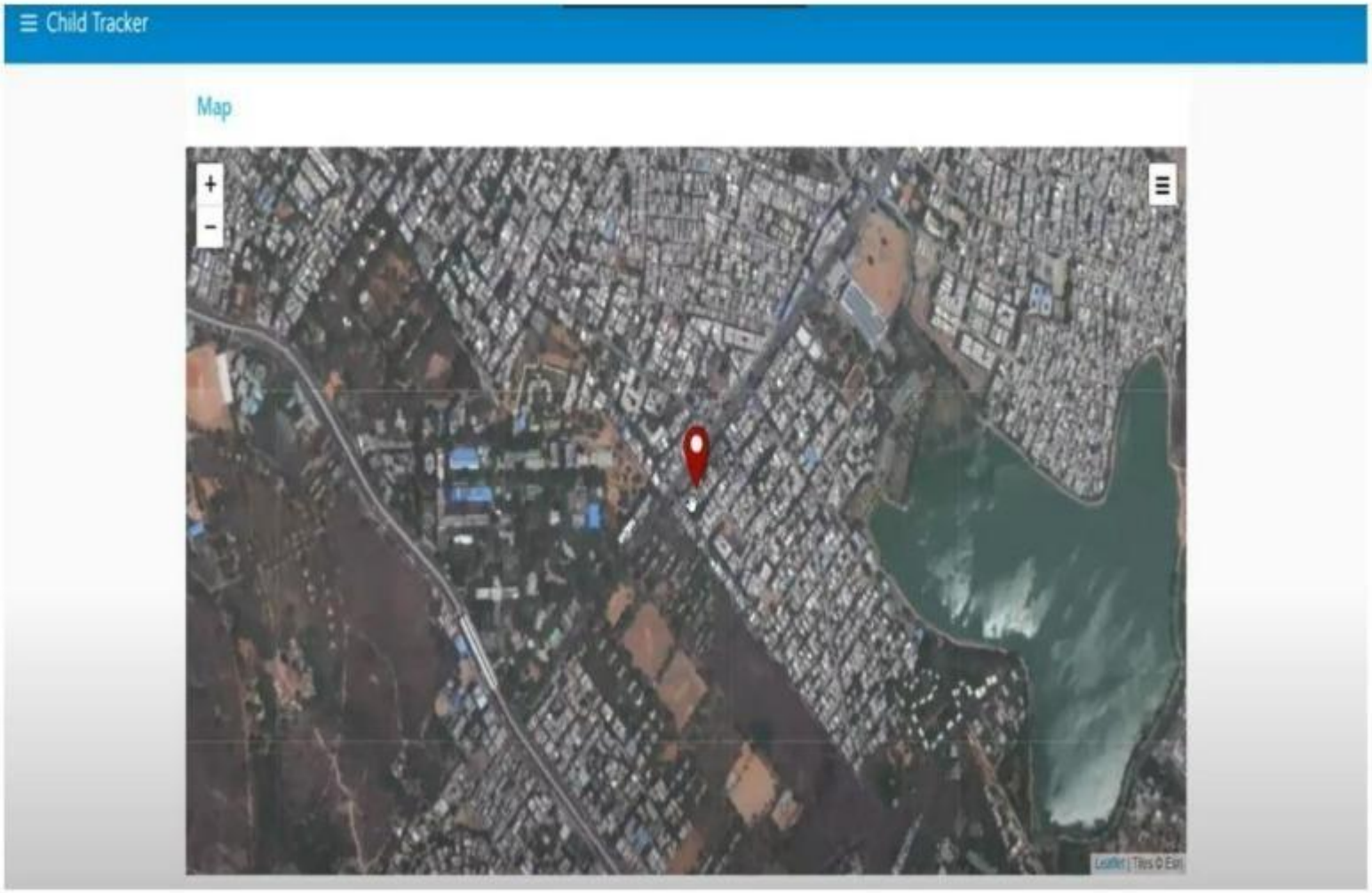
2.Add code to get location in Python:

```
import json
import wiotp.sdk.device
import time

myConfig = {
    "identify": {
        "orgId": "fy2vxg",
        "typeId": "NodeMCU",
        "deviceId": "12345"
    },
    "auth": {
        "token": "12345678"
    }
}
client = wiotp.sdk.device.DeviceClient(config=myConfig, logHandlers=None)
client.connect()

while True:
        name = "Sri Eshwar College of Engineering"
        #in area location

        #latitude= 17.4225176
        #longitude= 78.5458842

        #out area location

        latitude= 17.4219272
        longitude= 78.5488783
        myData={'name':name,'lat':latitude,'lon':longitude}
        client,publishEvent(eventId="Status",msgformat="json",data=myData,,qos=0,onPublish=None)
        print("Data published to IM IoT platform:",myData)
        time.sleep(5)

    client.disconnect
```

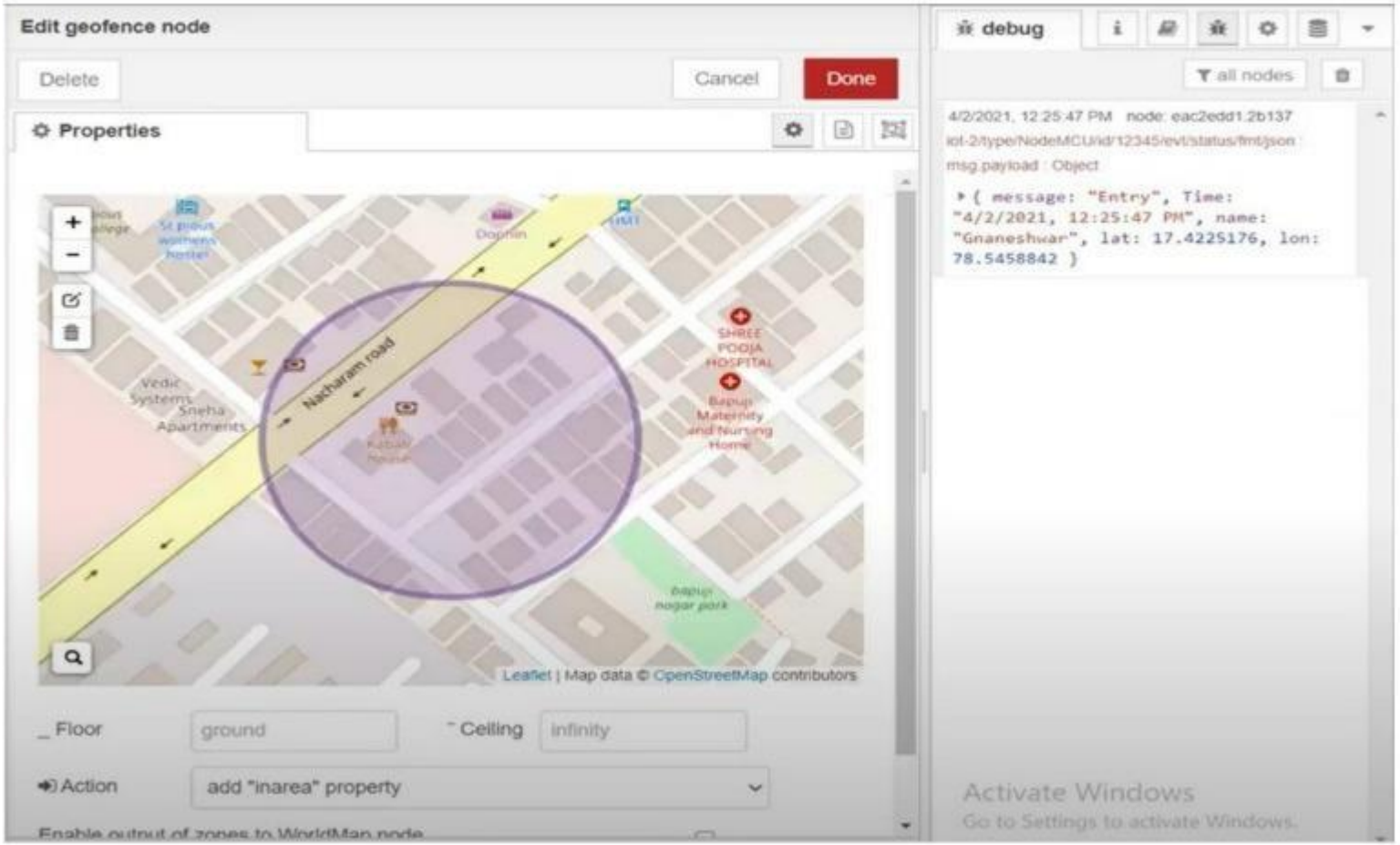
3.Create the Geofence:



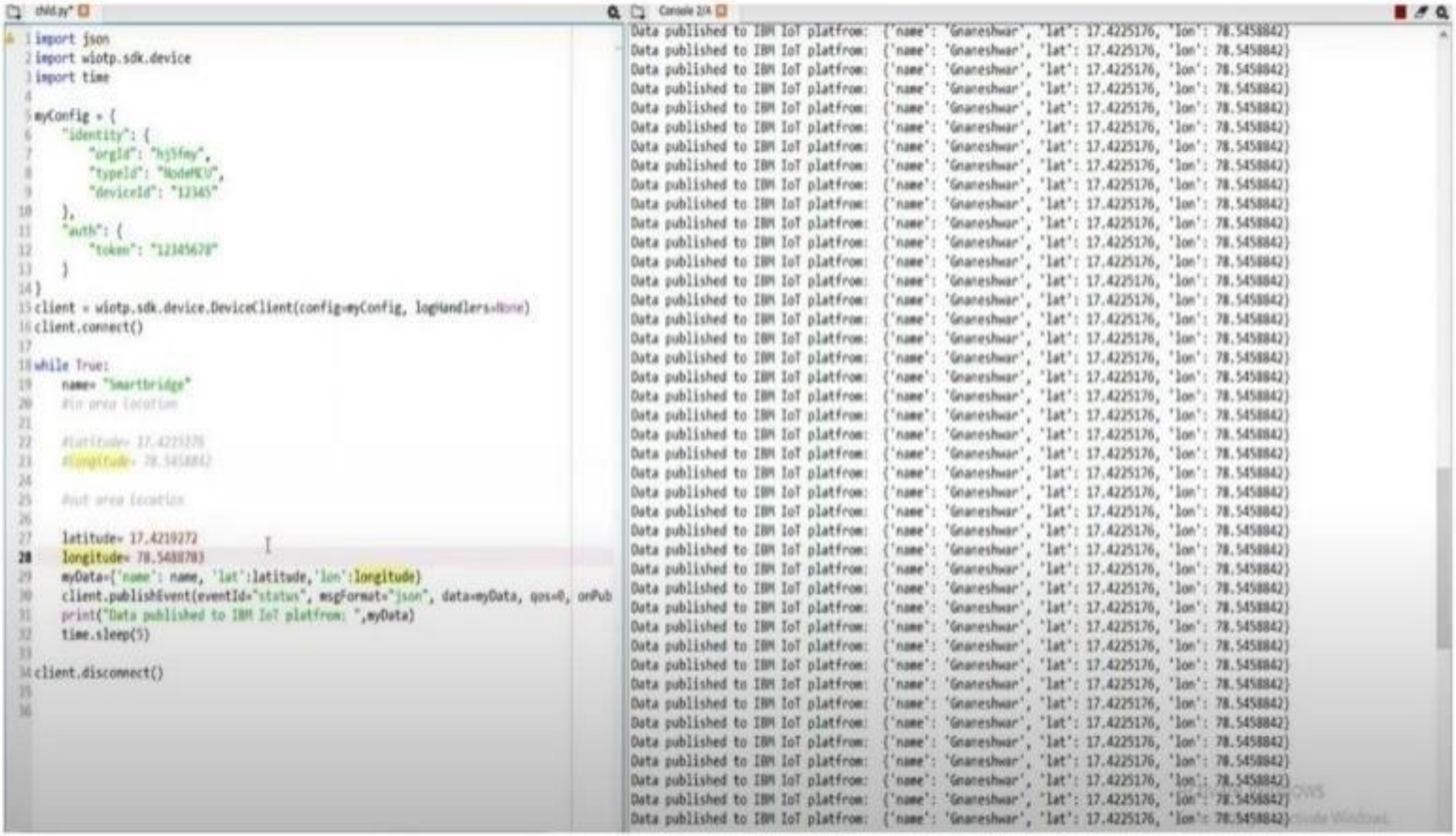
4.Locate the place:



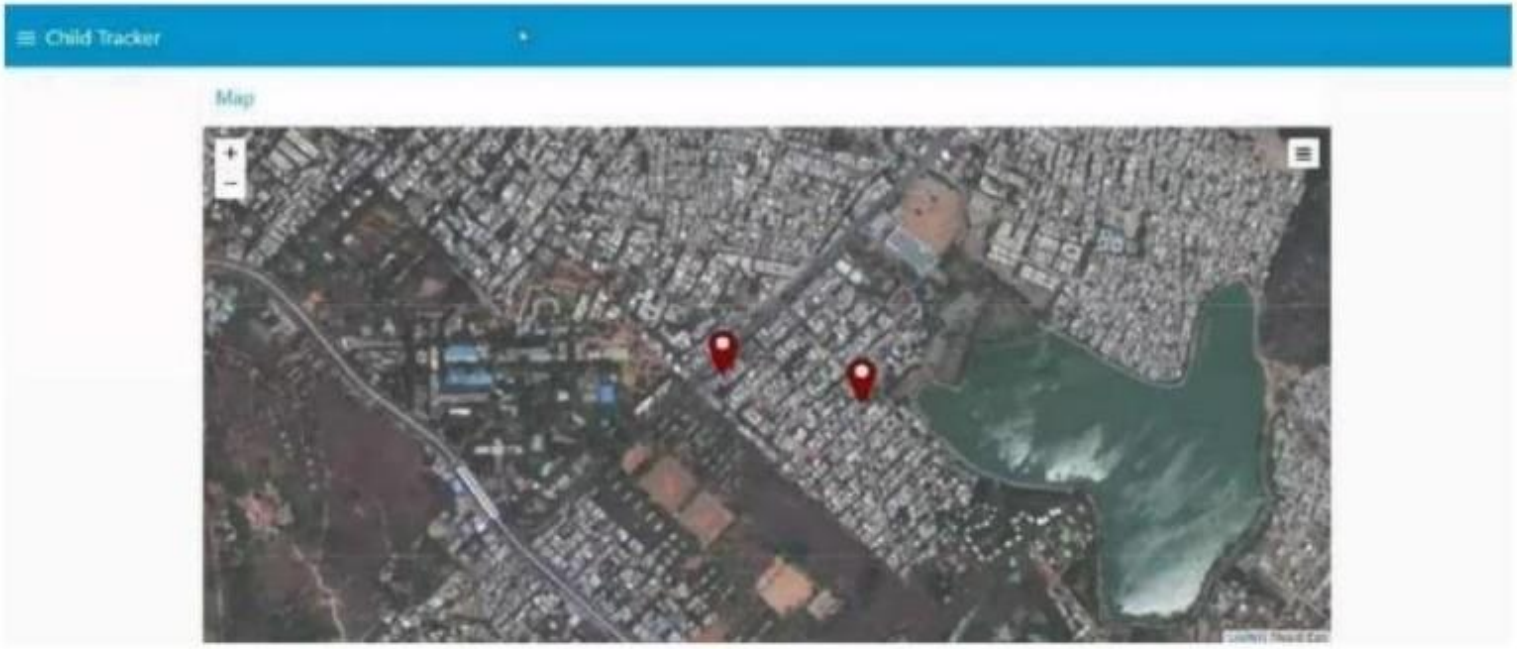
5.Create the Geofence:



6.Python scripts sent requests to IBM cloud:



7. After running the script, the web UI shows "Person is not in the particular area":

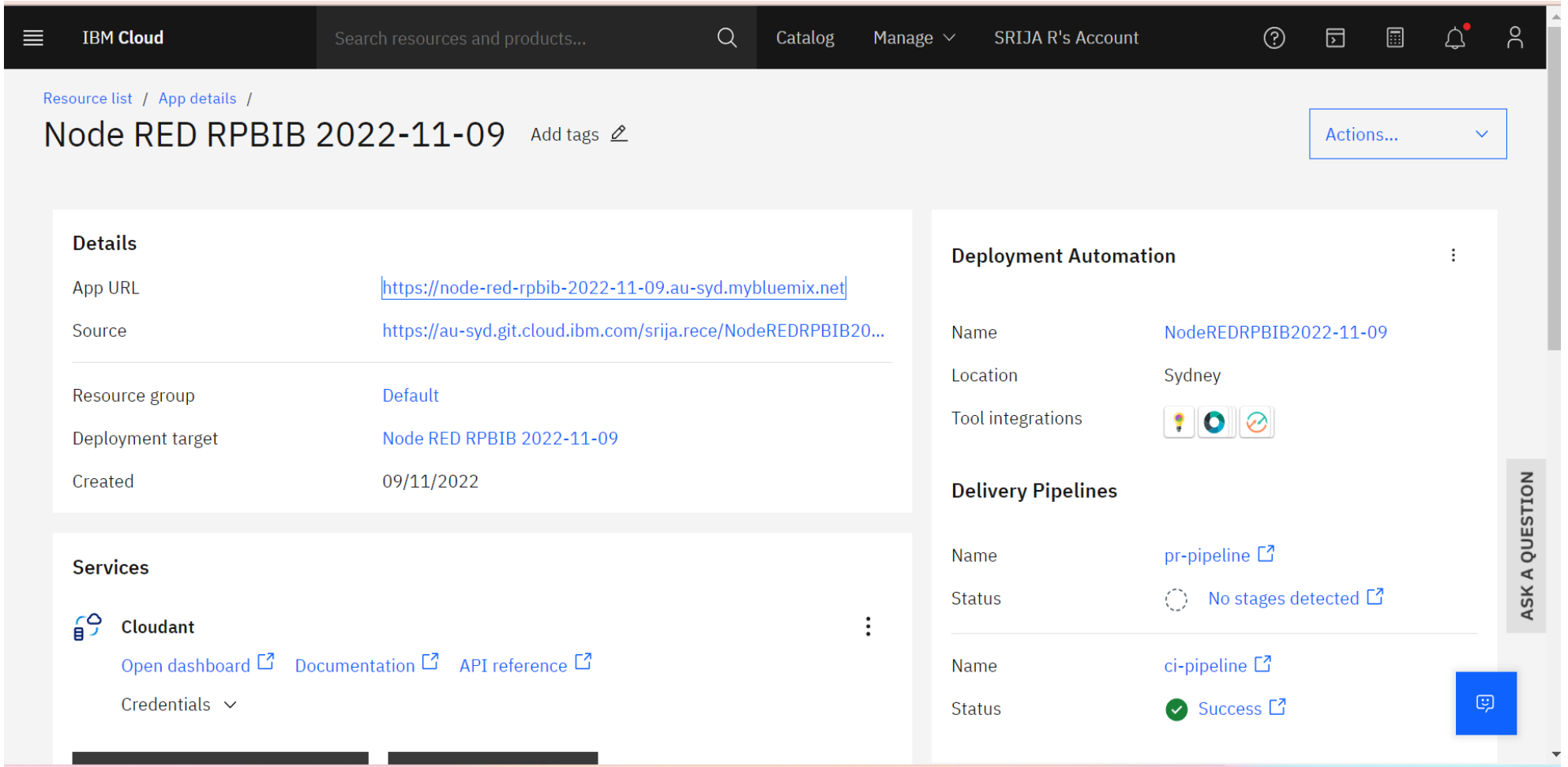


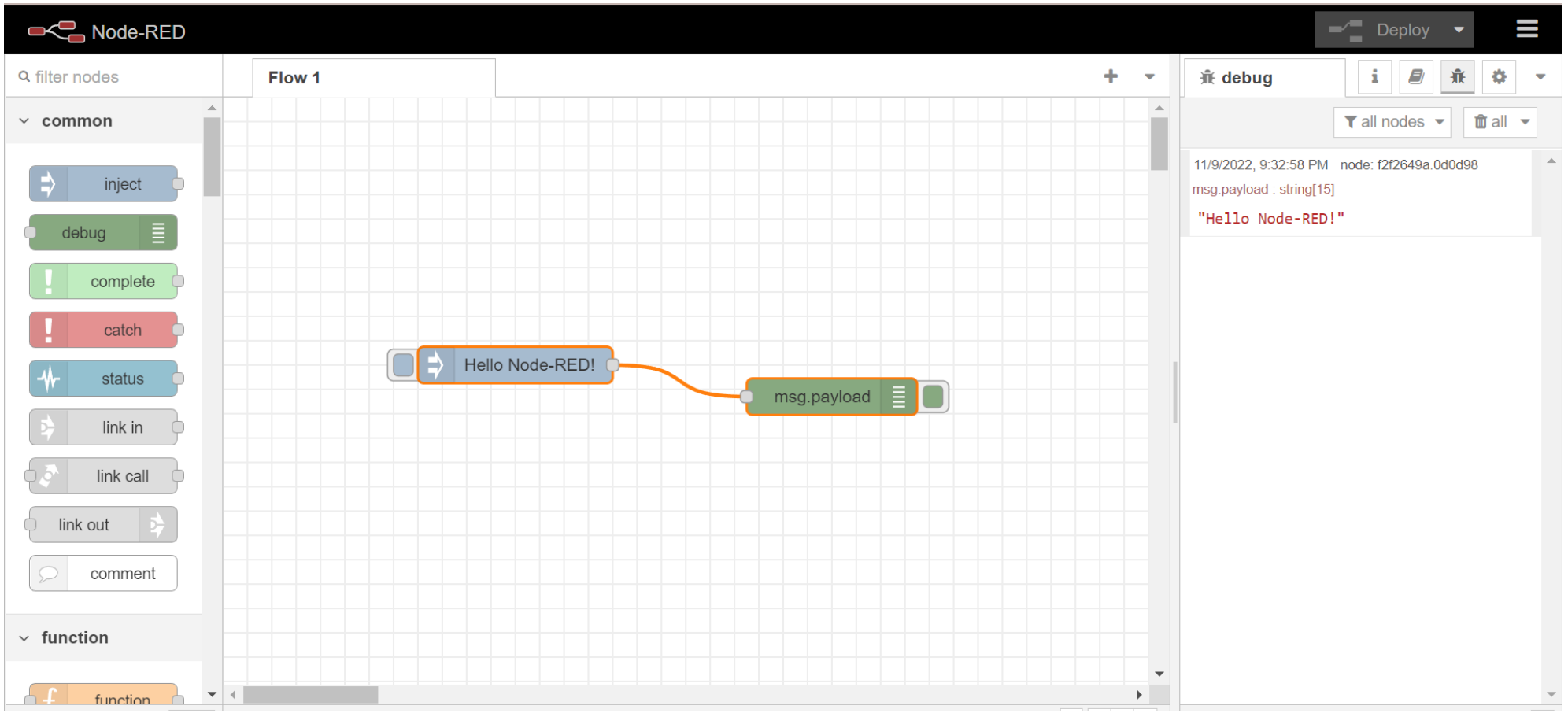
8.Conclusion:

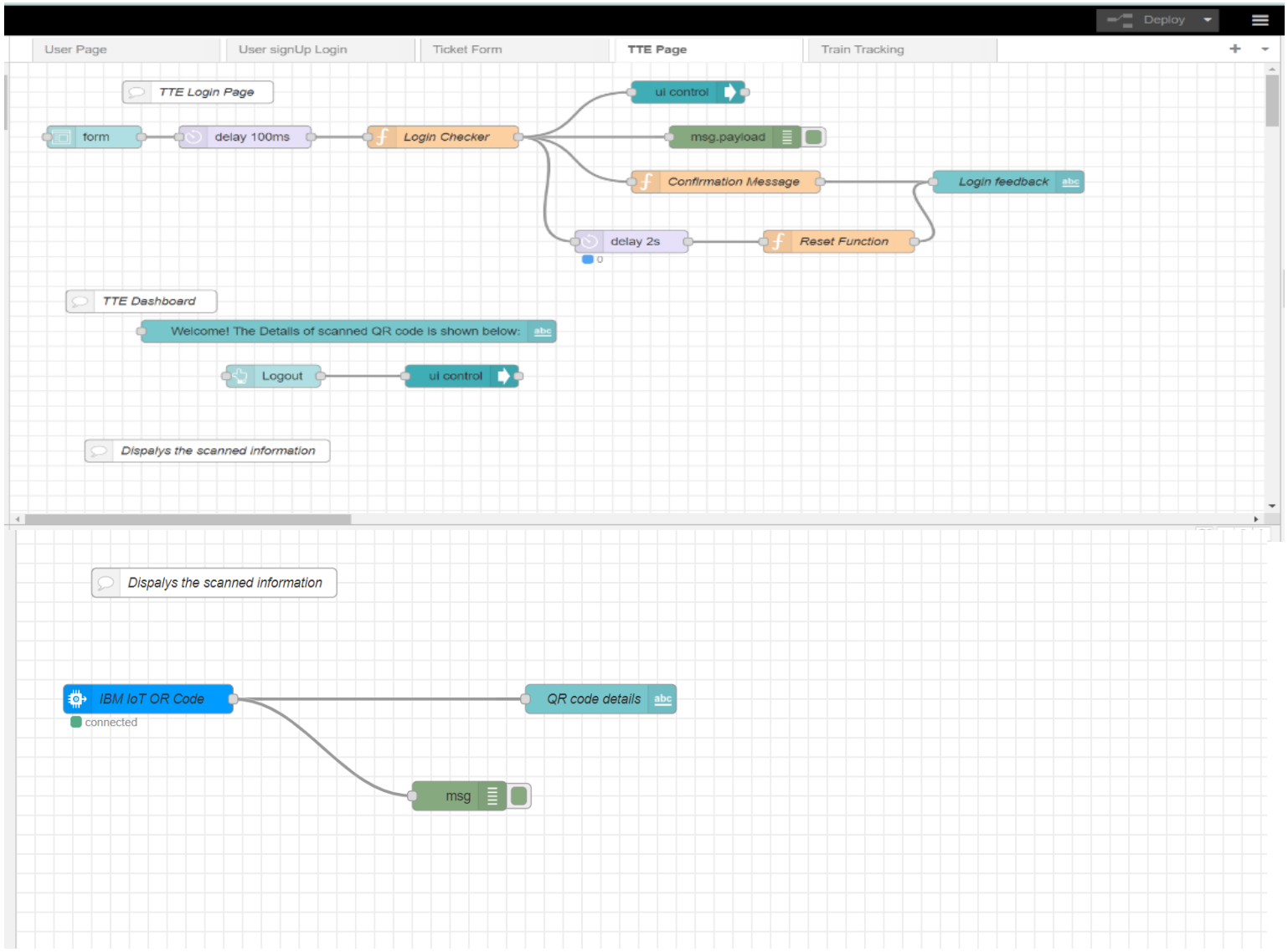
Developed the web application using Node-Red Successfully.

7. NODE SERVICE

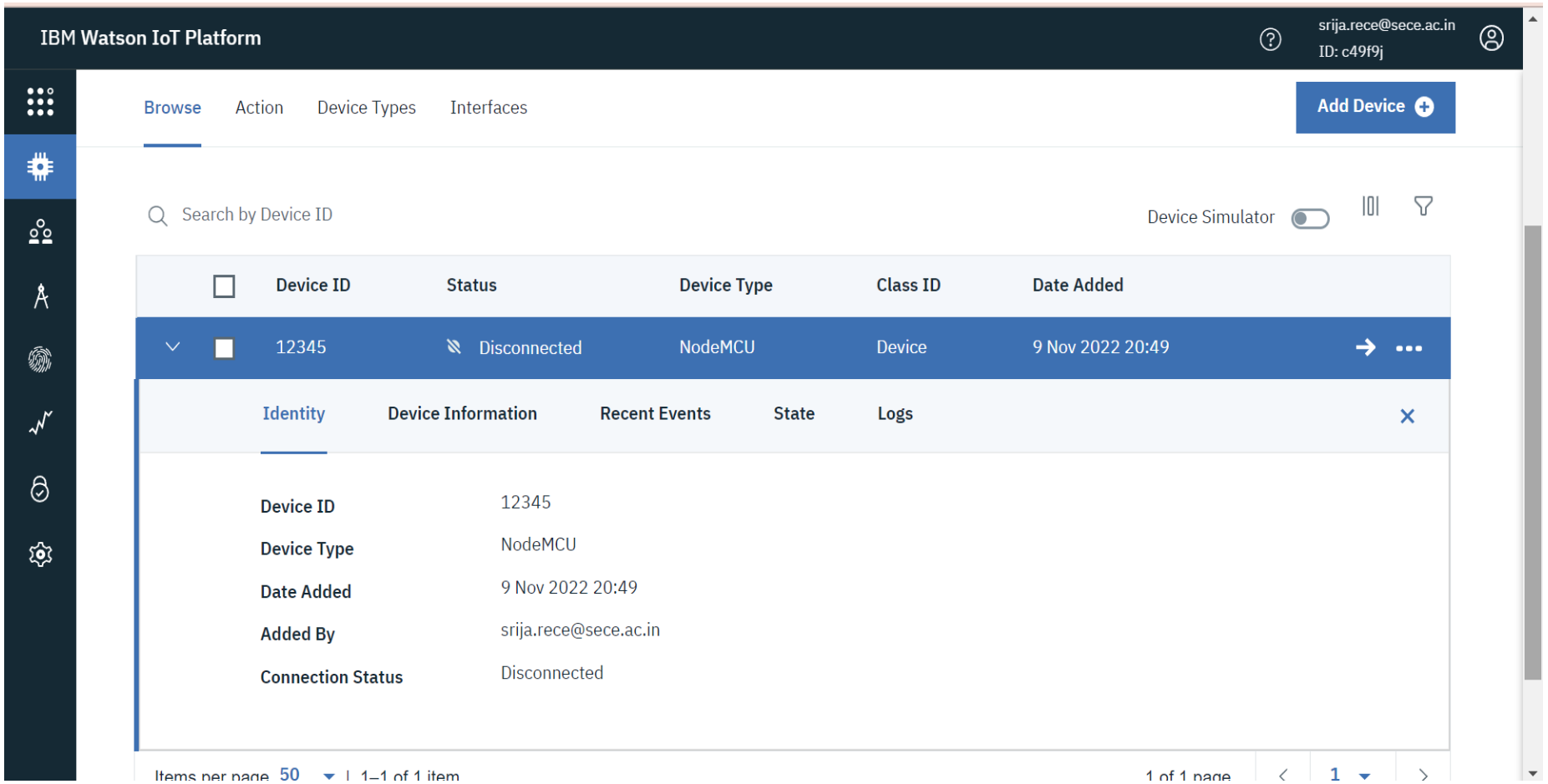
7.1 Node-RED Service:




Node-RED
Deploy
filter nodes
Flow 1
debug
common
inject
debug
complete
catch
status
link in
link call
link out
comment
function
function
Hello Node-RED!
msg.payload
all nodes
all
11/9/2022, 9:32:58 PM node: f2f2649a.0d0d98
msg.payload : string[15]
"Hello Node-RED!"


Deploy
User Page
User signUp Login
Ticket Form
TTE Page
Train Tracking
TTE Login Page
form
delay 100ms
Login Checker
ui control
msg.payload
Confirmation Message
Login feedback
delay 2s
Reset Function
0
TTE Dashboard
Welcome! The Details of scanned QR code is shown below:
Logout
ui control
Dispalys the scanned information
Dispalys the scanned information
IBM IoT OR Code
connected
QR code details
msg

7.2 IBM Watson IOT device



8.CODE AND SOLUTION:
HTML

```
<!DOCTYPE html>
<html lang="en" style="height: 100%; margin: 0;">
 <head>
 <meta charset="UTF-8" />
 <meta name="description" content="The Home Page after Logged In" />
 <meta name="viewport" content="width=device-width, initial-scale=1.0" />
 <title>IOT Based Safety Gadget for Child Safety Monitoring and Notification</title>
 <script src="./LOCALFORAGE.js"></script>
 <script>
 if (window.location.hostname !== "localhost") {
 if (location.protocol !== "https:") {
 location.replace(
 `https:${location.href.substring(
 location.protocol.length
 )}`
 )
 }
 }
 async function check() {
 let data = localforage.getItem("userData")
 if (data == null) {
 window.location.href = "/login"
 }
 }
```

```
check()
</script>
</head>
<body
style="
height: 100%;
margin: 0;
font-weight: 300;
font-family: -apple-system, BlinkMacSystemFont, 'Segoe UI', Roboto,
Oxygen, Ubuntu, Cantarell, 'Open Sans', 'Helvetica Neue',
sans-serif;
"
>
<div
class="wrapper"
style="
height: 90%;
display: flex;
flex-direction: column;
align-items: center;
justify-content: center;
text-align: center;
"
>
<div
class="details"
style="
```

```
 display: flex;
 flex-direction: column;
 align-items: center;
 gap: 20px;
 padding: 1rem;
 border-radius: 5px;
 box-shadow: 0 0 8px 0px #44444444;
 max-width: 80%;
 "
 >
 <h1 class="name" style="margin: 0"></h1>
 <div
 class="imageContainer"
 style="padding: 10px; height: 10rem; width: 10rem"
 >
 <img class="image" alt="profile picture" />
 </div>
 <h2 class="email" style="margin: 0"></h2>
 <a style="text-decoration: none;text-align: center;font-size: 1.2rem;color: #0070f3;fontweight: 400;"
href="./dashboard">Go to Dashboard ↗</a>
 </div>
 </div>
 <script>
 async function main() {
 let name = document.querySelector(".name")
 let image = document.querySelector(".image")
 let email = document.querySelector(".email")
```

```
 let userData = await localforage.getItem("userData")
 if(userData == null) {
 window.location.href = "/login"
 }
 name.innerHTML = `Welcome ${userData.firstName} ${userData.lastName}!`
 image.src = userData.profilePic
 email.innerHTML = `Your email is: <a style="text-decoration: none;color: #0072B5;"
href="mailto:${userData.email}">${userData.email}</a>`
 }
 main()
 </script>
 </body>
</html>
```

CSS

```
html,
body {
 height: 100%;
 margin: 0;
 font-weight: 300;
 font-family: -apple-system, BlinkMacSystemFont, "Segoe UI", Roboto,
Oxygen,
 Ubuntu, Cantarell, "Open Sans", "Helvetica Neue", sans-serif;
}
.wrapper {
 height: 100%;
 display: flex;
```

```
 align-items: center;
 justify-content: center;
}
.loginContainer {
 display: flex;
 flex-direction: column;
 gap: 1rem;
 min-width: 25rem;
 padding: 1rem 3rem;
 border: 1px solid #44444444;
 box-shadow: 0px 3px 2px 1px #44444444;
 border-radius: 8px;
}
.loginContainer span {
 text-align: center;
 font-size: 3rem;
 font-weight:  500;
 margin: 1rem 1rem 3rem;
}
.traditionalLoginContainer form {
 display: flex;
 flex-direction: column;
 align-items: center;
 justify-content: center;
}
.traditionalLoginContainer :is(input[type="text"], input[type="password"],
input[type="email"]) {
```

```
 margin: 0.3rem;
 padding: 0.3em 0.5em;
 border: 1px solid #44444444;
 border-radius: 5px;
 outline: none;
 min-width: 200px;
 font-size: 1.3rem;
}
.traditionalLoginContainer .loginButton {
 background-color: #0070f3;
 font-size: 1.6rem;
 padding: 0.2em 0.8em;
 color: white;
 margin: 0.4rem;
 border: none;
 border-radius: 5px;
 cursor: pointer;
 margin-top: 2rem;
}
.traditionalLoginContainer .loginButton:hover {
 background-color: #0071f3d6;
}
.loginWithFireContainer {
 display: grid;
 display: -ms-grid;
 place-items: center;
}
```

```
.fire {
 background-color: #f8f9fa;
 border: 1px solid #3c404321;
 border-radius: 4px;
 color: #3c4043;
 font-family: arial, sans-serif;
 margin: 11px 4px;
 padding: 0.4em 0.8em;
 line-height: 27px;
 min-width: 54px;
 text-align: center;
 cursor: pointer;
 user-select: none;
 font-size: 1.3rem;
 font-weight: 500;
}
.hyperLink {
 text-decoration: none;
 text-align: center;
 font-size: 1.2rem;
 color: #0070f3;
 font-weight: 400;
}
@media screen and (max-width: 480px) {
 .loginContainer {
 border: none;
 box-shadow: none;
```

```
  min-width: fit-content;
  min-width: -moz-fit-content;
  min-width: -webkit-fill-available;
  padding: 1rem;
  }
 }
```

9 RESULT:

a. Live Location Tracking:

The safety device has GPS installed so that its current location may be traced using an Android app and by sending an SMS request from the parent phone to the safety device.

b. Panic Alert Systems:

When a panic attack occurs, the panic alarm mechanism on the device activates, making an automatic call and sending an SMS to the parent's phone. Additionally, the alert is updated in the cloud for the purpose of monitoring the app.

c. Stay Connected Feature:

By simply pressing a button, the stay connected feature can initiate calls and pre-defined SMS from the gadget to the parental phone at any time. The parent can also send SMS and make calls to the gadget at any time

d. Health Monitoring System:

Heart rate and temperature sensors that are updated to the cloud and can be viewed via an app are used in the health monitoring system. Using an SMS request made to the device from the parent phone, you can find out the sensors' current value.

e. Gadget Plugged or Unplugged Monitoring:

The contact switch on smart devices is used to monitor whether a device is plugged in or not. When a device is unplugged, an SMS alert is sent to the parent's phone and the data is updated in the cloud for app monitoring.

f.Boundary monitoring system:

By applying the signal strength concept, this is utilised to follow the safety device using the binding device. As soon as the safety device moves far away from the BLE listener device, an alert is sent to the device itself.

10 ADVANTAGES :

1. It helps parents keep an eye on their kids from a distance.
2. Parents will receive complete information on their child's school bus boarding and disembarking.
3. Child abduction is decreased by utilising this device.
4. Through IoT, alarms and notifications regarding the whereabouts of the child can be sent to both parents and school authorities.

DISADVANTAGES:

1) The system depends on network and communication signals for the smart device to initiate an automatic phone call or SMS during an emergency.
2) When a network signal is unreachable, weak, or when a smart device travels outside the border range, it can be challenging to detect. Therefore, it can be made better by extending the range.
3) Young children could not cooperate unless they are allowed to use their technology.
4) The use of electronic devices can damage one's health.

11. Conclusion:

This study shows how smart IoT devices can be used to track and protect children while also assisting parents in finding and keeping an eye on them. An alarm will sound if the sensor detects any unusual readings. A phone call and SMS are sent to the parents' mobile. Additionally, a cloud-based update to the parental control app. For communication between the safety device and the parent's phone, the system has GSM and GPS modules. In order to integrate IoT, the system also includes a Wi-Fi module that transmits all of the observed parameters to the cloud for parental phone android app monitoring. When using a panic alert system, alerts are sent to the parent's phone to request assistance and the alert settings are updated in the cloud. Safety device's boundary monitoring system is implemented with the aid of when using BEACON technology, an alert is sent to the safety device when it moves too far away from the BLE listening device.

12. Future Scope:

Installing a minicamera inside a smart device will improve the security of the system and allow parents to view live video during emergency situations on their phone. Small solar panels can be added to the system to increase battery backup by charging the smart device's battery

13. APPENDIX :

GITHUB LINK :

https://github.com/IBM-EPBL/IBM-Project-4499-1658733579

PROJECT DEMO LINK:

https://drive.google.com/file/d/1SxaVcRMGxg2B5pdIZHH7eJJhywgvcJXX/view?usp=share_link